



GTEC UPS MODEL:

LIBRA PRO IGBT

Input DSP Control Card

SERVICE MANUAL

Subject: Service Manual of Input DSP Control Card for LibraProIGBT
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Variation: See Document variation paragraph

Service Manual

LibraPro IGBT-INPUT

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1. General information

This board is based TMS320F2810 digital signal processor (DSP) and it controls an IGBT Mirror rectifier and a Buck Boost stage to charge and discharge the battery.

2. Board Layout

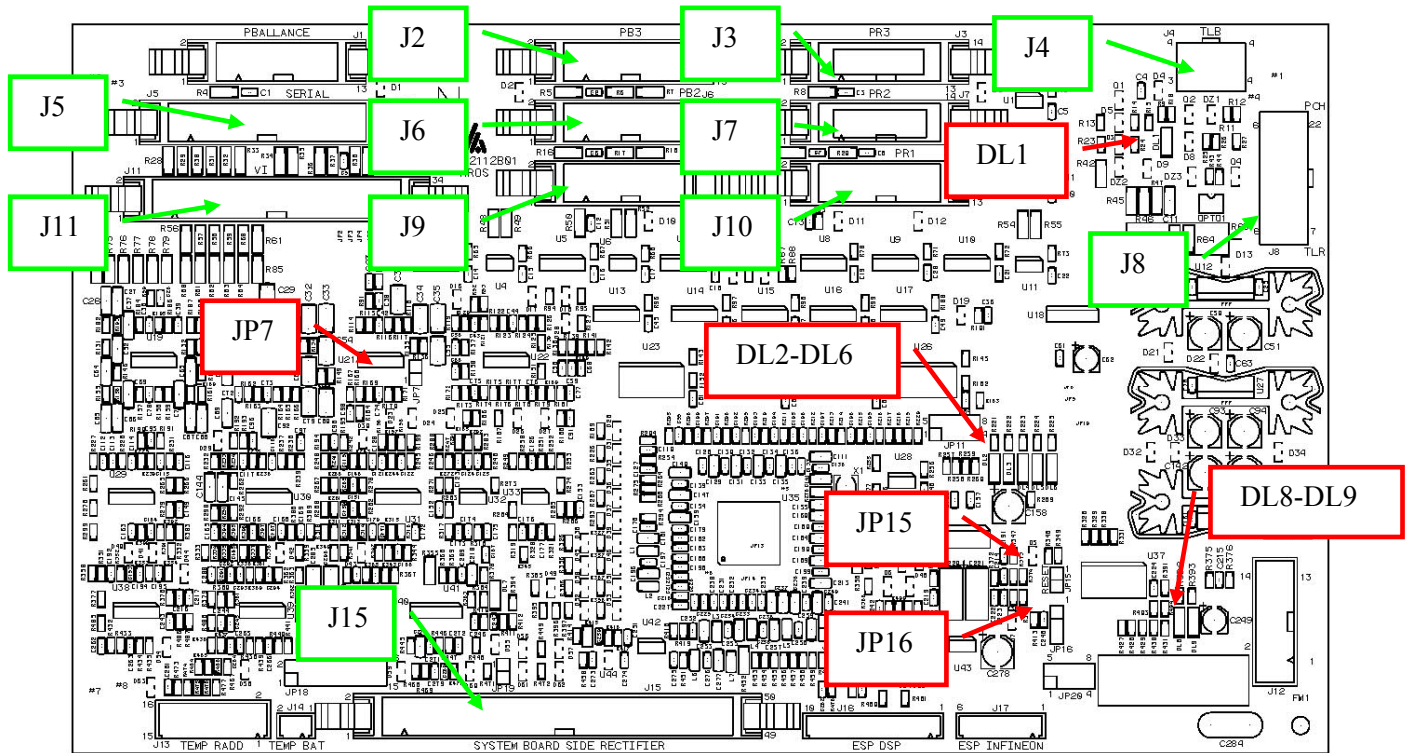


Figura 1

Tabella 1: Connector

Connector	Type	Label	Function	Conection
J1	Flat	PBALLANCE	not used	
J2	Flat	PB3	Drive IGBT	Igbt Driver Battery
J3	Flat	PR3	Drive IGBT	Igbt Driver Rectifier Phase 3
J4	Mini-Fit	TLB	not used	
J5	Flat	SERIAL	Serial	System board and RS232
J6	Flat	PB2	Drive IGBT	Igbt Driver Battery
J7	Flat	PR2	Drive IGBT	Igbt Driver Rectifier Phase 2
J8	Mini-Fit	PCH-TLR	Drive Precharge and TLR	PCH TLR
J9	Flat	PB1	Drive IGBT	Igbt Driver Battery
J10	Flat	PR1	Drive IGBT	Igbt Driver Rectifier Phase 1
J11	Flat	VI	interface	Interface V I card
J15	Flat	SYSTEM B.	Interface	Interface system board

Tabella 2: Jumpers

Jumper	Size	Function
JP7	1x2	Bootstrap loader jumper
JP15	1x2	Reset jumper
JP16	1x3	Reference voltage jumper

Tabella 3: Leds

Led	Colour	Controlling Signal
DL1	Green	Power Good Led
DL2-DL6	Yellow	Status Led
DL8	Green	Power Good 1.9V Led
DL9	Green	Power Good 3.3V Led

3. Preliminary Verification

Supply power to the board (Close SWBY).

Verify:

- DL1 (Power Good), DL8 (Power Good 1.9V)and DL9 (Power Good 3.3V) are continuously ON.
- The voltage between pin 1 and 2 on JP16 is 3.3V +/- 20mV.
- The voltage between pin 3 and 2 on JP16 is 1.9V +/- 20mV.
- If the board is already programmed the DL2 blink (Activity led)
- If the board is not programmed the DL2 to DL6 are continuously on.

Note: if the leds DL2 to DL6 blink slowly (at the same time all turn on and off with period 0,5sec)the program inside the board is not corrected.

4. Service Software Instruction

4.1. DSP Flash installation

Overview

DSP Flash is a service software to update the firmware on the DSP board.

Prerequisites

Hardware requirements:

- PC with a RS232 with an operative system.
- the serial cable M/F for RS232 9 poles pin to pin (supplied with the UPS)

Supported Operating System:

- Microsoft Windows XP with and .NETFramework 2.0 installed

Software

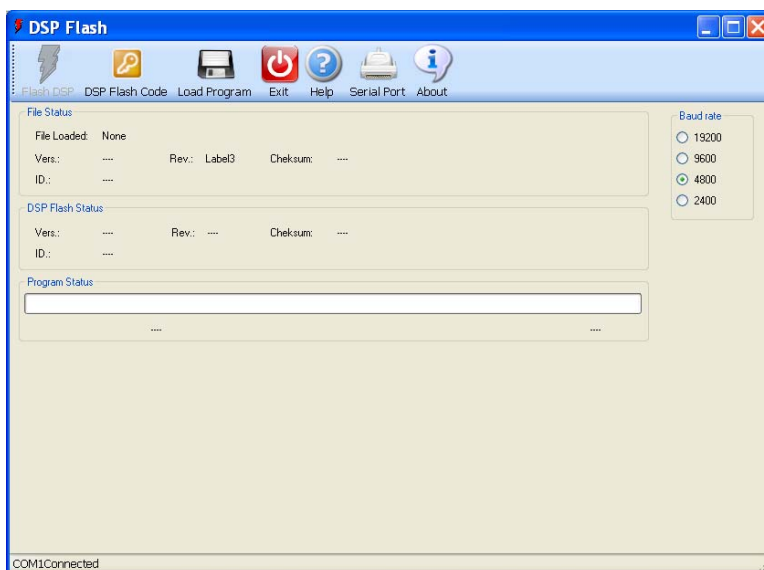
- the program DSPFlash.exe
- the firmware PXMxxxx rev.xx ck=xxxx .hex

Installing DSP Flash

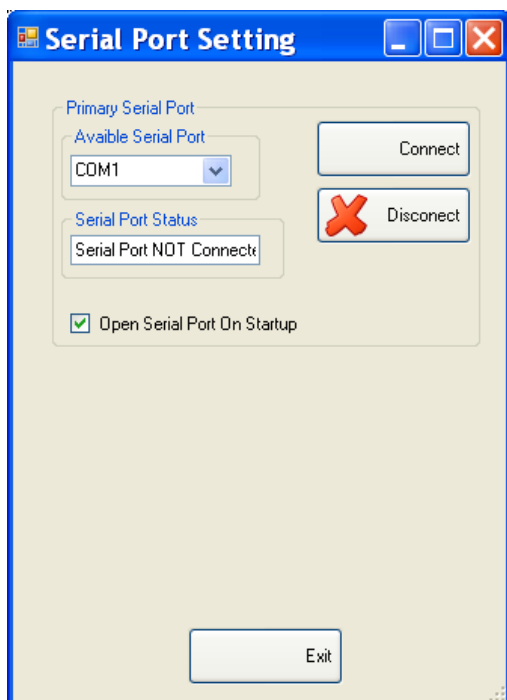
To Install the program DSP Flash on a PC copy the file DSPFlash.exe in a directory of the PC.

4.2. DSP FLASH Configuration

Launch the program DSPFlash.exe.

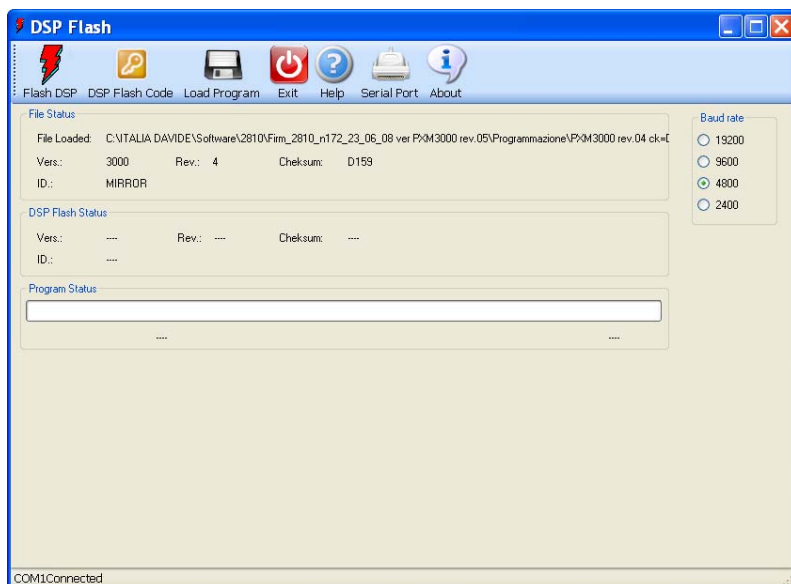


Click on the icon “Serial Port” and chose the Serial Port



4.3. DSP FLASH Use

Click on the icon “Load program” and chose the program to load.



Note: in File Status will appear all the information about the program.

4.4. Put the board in bootstrap mode

To put the DSP board in bootstrap loader mode is possible in 3 way:

Bootstrap Mode		
Method	UPS Accessibility	Use
A) By Command DSP Flash Code	Front door	Normal mode
B) By UPS Code	Front door	To use if the Flash DSP command don't work
C) Hard Method	Internal Board	To use if System board (2032) (Infineon) is not programmed or method A and B fail

Note: before to operate is possible to Close SWMB to supply the load.

But in this situation any disturbance (such as a blackout) on the UPS supply line would have an effect on the equipment powered (since the batteries are deactivated in this state).

A) By Command DSP Flash Code (UPS Closed)

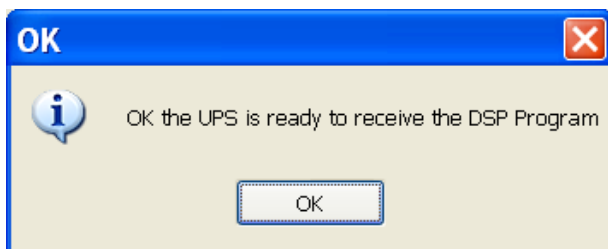
Prerequisites

- SWIN and SWOUT open
- SWBY Close

Steps

1. Click on "DSP Flash Code" (in the toolbar)

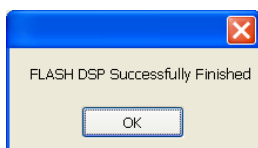
If the command will be successful on the program will appear this message:



and on the panel of the UPS appear

System OFF, DSP firmw.=v.3000, ck=1ABC
Waiting to receive new program for DSP

2. Click on the icon "Flash DSP" (in the toolbar)
3. Wait that the program will be loaded.
4. If the program is loaded correctly the following message will appear:



5. Exit from the menu
6. Open SWBY, and wait until the LCD turn off.
7. Close SWBY
8. Push the button 7, 7

s=0000 c=0000 b=0000 r=C081-08 i=0001-08 a=4100-0000 VD=3000-1ABC

9. Verify that the Version, revision and the Checksum are the same of the version loaded.

B) By UPS Code (UPS Closed)

Prerequisites

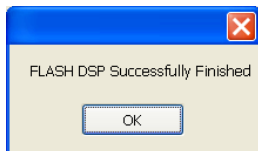
- SWIN and SWOUT open
- SWBY Close

Steps

1. Insert the code **151515 221314** (bootstrap dsp), and on the pannel of the UPS

System OFF, DSP firmw.=v.3000, ck=1ABC Waiting to receive new program for DSP
--

2. Click on the icon “Flash DSP”
3. Wait that the program will be loaded.
4. If the program is loaded correctly the following message willl appear:



5. Exit from the menu
6. Open SWMBY, and wait until the LCD turn off.
7. Close SWMBY
8. Push the button 7, 7

s=0000 c=0000 b=0000 r=C081-08 i=0001-08 a=4100-0000 VD=3000-1ABC

9. Verify that the Version, Revision and the Checksum are the same of the version loaded.

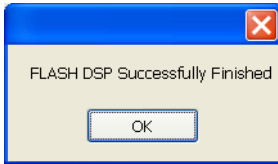
C) Hard Method (UPS Open)

Prerequisites

- SWIN and SWOUT open
- SWBY open

Steps

1. Disconnect the flat cable on board 2032 J6
2. Close JP7
3. Close SWBY
4. Close and open JP15
5. Click on the icon “Flash DSP” and wait that the program will be loaded.
6. The program is loaded correctly if appear the window:



7. Open JP7 (during or after the programming)
8. Close and open JP15
9. Verify that only DL2 blink.
10. Open SWBY, and wait until the LCD turn off.
11. Reconnected the flat cable on board 2032 J6
12. Close SWBY
13. Push the button 7, 7

s=0000 c=0000 b=0000 r=C081-08 i=0001-08 a=4100-0000 VD=3000-1ABC
--

14. Verify that the Version, revision and the Checksum are the same of the version loaded.

5. Debug Mode

```

GT10    v0027 -      2008-05-23 14:21 -  Alim=HP    Radd=DSP    Inv=CAN
Vbat_rad [V]= 448.5    Vbyp1 [V]= 219      Vdc_inv [V]= 616
Ibat_charge [A]= 0.0    Vbyp2 [V]= 219      V_alim_8V [V]= 8.554
Ibat_dischar[A]= 0.0    Vbyp3 [V]= 215      Vref/2 [V]= 2.302
Vin1_rad [V]= 213.9    Vout1_inv [V]= 230   Vout1_ups [V]= 230.0
Vin2_rad [V]= 213.9    Vout2_inv [V]= 230   Vout2_ups [V]= 230.0
Vin3_rad [V]= 211.6    Vout3_inv [V]= 230   Vout3_ups [V]= 230.0
Iin1_rad [A]= 0.5      Iout1_inv [A]= 1.0    Iout1_ups [A]= 0.2
Iin2_rad [A]= 0.5      Iout2_inv [A]= 1.0    Iout2_ups [A]= 0.2
Iin3_rad [A]= 0.5      Iout3_inv [A]= 0.9    Iout3_ups [A]= 0.2
Freq_rad [Hz]= 50.0    Freq_byp [Hz]= 50.0  Freq_inv [Hz]= 50.0
Vdc_rad(L+H) [V]= 619.3 Freq_pwm [Hz]= 7200
Vdc_H_rad [V]= 310.6   Patt1_ups [W]= 36
Vdc_L_rad [V]= 308.7   Patt2_ups [W]= -1
Vin12_rad [V]= 376.7   Patt3_ups [W]= 0
Vin23_rad [V]= 372.9   Patt1_inv [W]= -5    Patt2_inv [W]= -32   P_tot_ups [W]= 35
Vin31_rad [V]= 372.5   Patt3_inv [W]= -42   P_tot_ups [VA]= 138

3/4 Vdc[V]= 620      5/6 IMaxRadd[%]= 100    7/8 IBatCh[%]= 0      9/0 IMaxBt[%]=100
J/K ParzPrch[V]= 0    1/2 VBatCh[V]= 444

A/AlimBt= 1      I/Inv_On= 1      R/IO_Exp= -      SWOUT = 1      CAN= OK
Y/PzPrch= 0      S/ScrByp= 0      SWMB = 0      St = 0      CF= 1
C/Rad_On= 1      T/TL_Inv= 1      Q/BCharg= 1      TA_scr= 0      PID= On      TT= OK
P/Prech = OK      TLR = 1          D/BDisch= 0      Alim = OK      Fan= OK      Cy= OK

```

Command		
Keyboard Command 1	Keyboard Command 2	Function
C	1	Turn on the rectifier
C	0	Turn off the rectifier
Y	1	Start Partial precharge
Y	0	Stop Partial precharge
P	1	Start Precharge
P	0	Stop Precharge
Q	1	Start Battery Charger
Q	0	Stop Battery Charger
D	1	Start Battery Discharger
D	0	Stop Battery Discharger
3		Increase Vdc Reference
4		Decrease Vdc Reference
5		Increase ImaxRadd
6		Decrease ImaxRadd
J		Increase Vdc Reference Partial Precharge
K		Decrease Vdc Reference Partial Precharge

6. Debug Status or Alarm

Status or Alarm: C/Rad On	
LINK	link fail (isn't necessary that DSP firmware is loaded)
POWER	
VACin	
EECal	
EEVrg	EEPROM Found Virgin (this message appear at the first turn on and it must disappear if you turn off and on the UPS; otherwise it show a problem into EEPROM)
EE WR	
EEIni	
EPO	Jumper between pin 3 e 7 JP21 absent
8V	
Init	firmware not loaded on DSP / DSP non connected / var not init
2.3V	
Can	
XTAL	
I1max	
I2max	
I3max	
Pmax	Limit. Pot Sw
I Unb	(b7 Alarm5)
V Unb	Voltage Unbalance (abs(Vdc_h-Vdc_l)>50V)
CYCLE	
ADJ1I	ERRORE ADJUST I1 -> verify PHASE 1 LEM
ADJ12	ERRORE ADJUST I2 -> verify PHASE 2 LEM
ADJ13	ERRORE ADJUST I3 -> verify PHASE 3 LEM
ADJV1	ERRORE ADJUST V12 -> verify V12
ADJV2	ERRORE ADJUST V23 -> verify V23
ADJV3	ERRORE ADJUST V32 -> verify V31
ADJ1c	ERRORE ADJUST Icharge-> verify BATTERY LEM
ADJ1d	ERRORE ADJUST Idischarge-> verify BATTERY LEM
ADJHW	A_BOOST_DSP_ADJ_FAIL_HW_KO
ADJAC	A_BOOST_DSP_ADJ_FAIL_MAIN_KO
OVP	Over voltage Rectifier (latched for 10sec)
DC hw	
DCLsw	
DCHsw	
DESA1	Desaturation Module 1 Rectifier
DESA2	Desaturation Module 2 Rectifier
DESA3	Desaturation Module 3 Rectifier
SS DC	
SS AC	
VBAT	
DCinv	
SYSpw	
Mpwr	
HFpwr	
InvW-	
SXTAL	
PROG	
I OL	
1	Rectifier On
0	Rectifier Off

Status or Alarm: C/Rad_On	
OK	
1	
0	

Status or Alarm: P/Prech	
ERR	
OK	
1	
0	

Status or Alarm: Y/PzPrch	
1	This command close the precharge contactor circuit up to the the Bus DC reach the voltage settled on " ParzPrch[V] ". After this command the ups accept the open loop command
0	Open of the precharge contactor.
OK	
ERR	

If the execution of the command will be correct the system accept the OPEN LOOP command

Status or Alarm: Q/BCharg	
Imax	
VbatH	
Desat	
NOreg	
I OL	
1	
0	

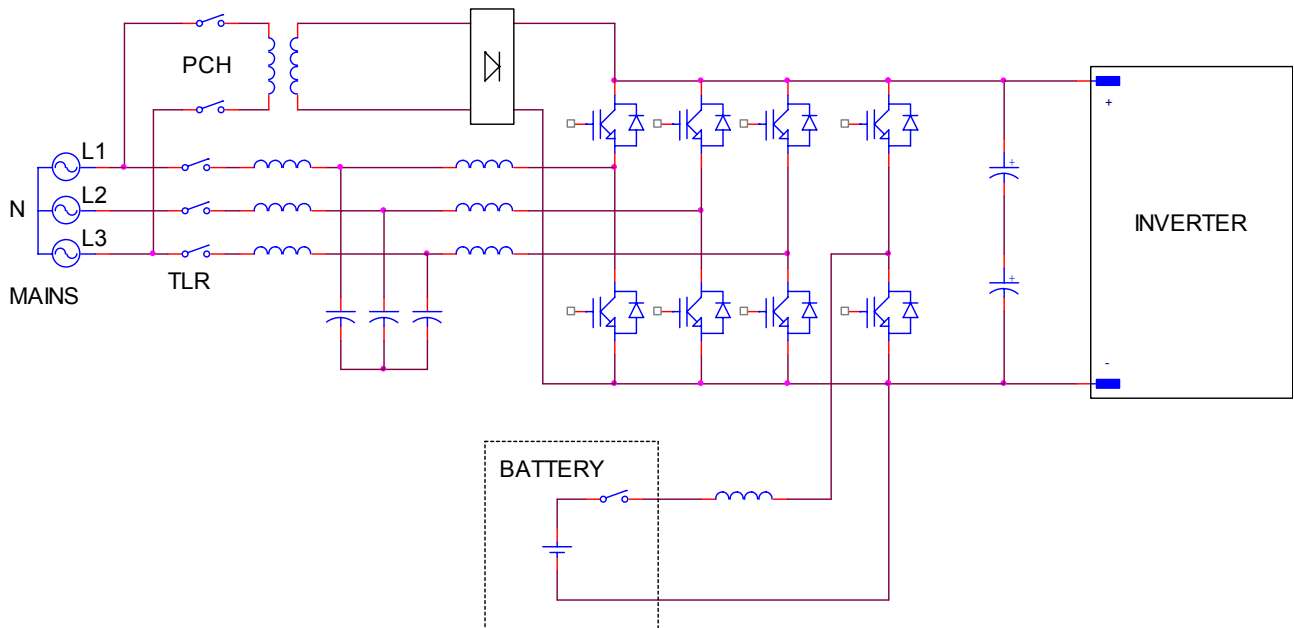
With this command the IGBT of the battery are driven with a pulse: 45ms floating 5ms high/low

The command Y/PzPrch 1 is possible only after the command P/Prech=1

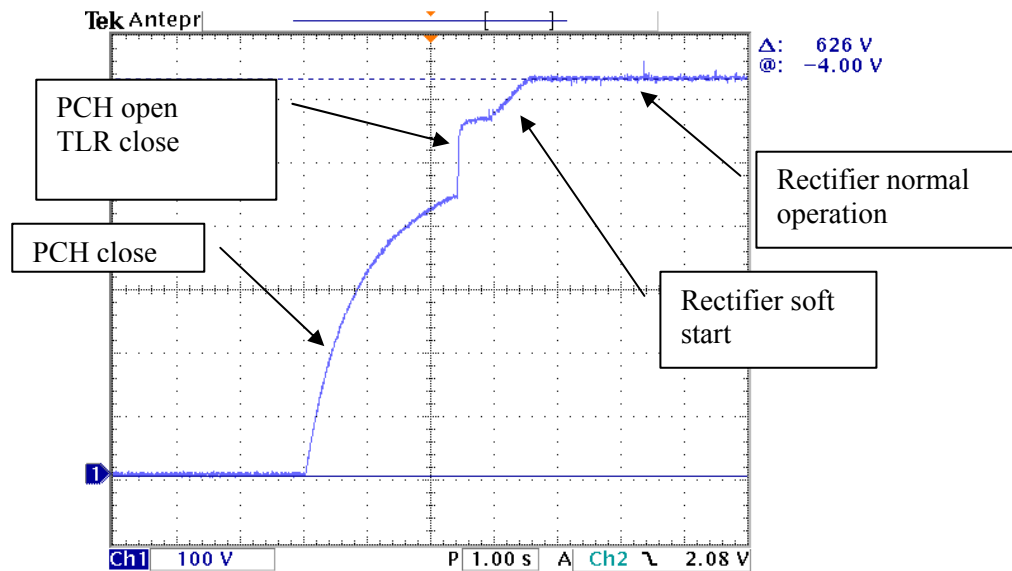
If Vbat>100 before the command Y/PzPrch 1 is not executed and it gives the error Alarm 10 bit2 "KO_OPEN_LOOP_CH_DIS_BAT_FOR_VBAT_HI".

Status or Alarm: D/BDisch	
Imax	
VbatH	
Desat	
RadON	
I OL	
1	
0	

7. Rectifier Schematic



Voltage across the DC BUS at the first start



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8. Troubleshooting

A) Hardware

N°	FAULT	CAUSE	SOLUTION
1	DL1 Power Good Led (2112)OFF	Verify:Power supply Led PWGOOD MAIN and PWGOOD REDUNDANT are ON	Remove all connectors from 2112 and verify DL1(2112).
2	C/Rad_On = Init	Verify Sensor (Iin, Ibat) are connected correctly. Vin, Iin, Vbat Ibat have nominal value	Turn off and turn on the UPS.
3	C/Rad_On = Link	The link is missing	Verify: J2,J6,J9,J3,J7,J10, J11 are connected

B) Software

N°	FAULT	CAUSE	SOLUTION
1	The command “DSP Flash Code” fail	The SWOUT is CLOSE	Open SWOUT
2	The command “DSP Flash Code” fail	Setting of the RS232 not standard	- insert the code 436215 - set RS232 = 9600 baud, - set Echo RS232-1 = 0 - set Echo RS232-2 = 0 - set Ident. = 0
3	It's not possible to insert the code 151515 +221314	The SWOUT is CLOSE	Open SWOUT
4	It's not possible to flash the dsp	J5 is disconnected	connect J5
5	It's not possible to flash the dsp	Card in the SLOT 1	Remove the card in the SLOT 1

8.1. Check of Link signal

8.1.1. Signal path:

The Link signal start on the Micro system card (2032) with a pull up resistor connected to 5Vdc on the pin 17 connector J3. The final closure is to GND (0VDC) on the pin 34 connector J11 in the card 2112.

On the card 2112 the link go to the other card as shown in the following table:

Point N°	Start (Card-Connector-pin)	Connettore tipe	Finish (Card-Connector-pin)	Connected to
1	2032-J3- pin 17	Flat 50 pin	2112-J15-pin 17	System card
2	2112-J10- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PR1
3	2112-J10- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PR1
4	2112-J7- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PR2
5	2112-J7- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PR2
6	2112-J3- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PR3
7	2112-J3- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PR3
8	2112-J1- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PBALLANCE
9	2112-J1- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PBALLANCE
10	2112-J9- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PB1
11	2112-J9- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PB1
12	2112-J6- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PB2
13	2112-J6- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PB2
14	2112-J2- pin 13	Flat 14 pin	2102-J3-pin 13	Driver card PB3
15	2112-J2- pin 14	Flat 14 pin	2102-J3-pin 14	Driver card PB3
16	2112-J11-pin 33	Flat 34 pin	2108-J2-pin 33	Interface VI RECT. INV.
17	2112-J11-pin 34	Flat 34 pin	2108-J2-pin 34	Interface VI RECT. INV.

8.1.2. Failure research:

Connect the negative dc probe of a multimeter (set in DC voltage measure) to the cristal quartz body (X1) on the 2032 system card, check with the positive probe the connector terminals shown in the above table. If you measure a dc voltage (about) 5V in a point it means that the path to the ground is interrupted otherwise if you measure a dc voltage (about) 0V in a point it means that the path to the ground is OK.

8.1.3. Example of failure research:

Suppose that the Flat connector on 2112-J6 is unplugged (Point N° 13-14 in the table).

If you measure on 2112-J6- pin 14 (Point N° 13 in the table) you will find a dc voltage of 5V.

If you measure on 2112-J11- pin 33 (Point N° 16 in the table) you will find a dc voltage of 0V.

This show you that there is an open link between the point N° 13 and point N° 16.

If you measure on 2112-J6- pin 13 (Point N° 14 in the table) you will find a dc voltage of 5V this show that the connector J6 is unplugged because in point 13 the link is ok but in the point 14 is fail.

As showed by the table between this two point there is only the connector J6 so you understand that is the connector J6 that open the link.

9. Firmware Revision History

PXM3001 rev.19 (input DSP , ck= D8FB)(itda, 140110,scma).hex

- Added start from battery

Note: this operation require:

- the system firmware PXP027.rev37 or higher

PXM3001 rev.14 (input DSP, ck=9AFB)(itda,290709,scma).hex

- Management of parallel system with only one battery

- Improved the control to reduce the input current distortion at low load and improved the stability in the case of feed with a gen set or high impedance mains.

- Possibility to work with independent cyclic rotation of the phases (it must be enabled by the code 311331)

PXM3001 rev.02 (input DSP, ck= EDDC)(itda,040308,scma).hex

- Improved input current limitation to avoid stopping in case of output overload

Note: this operation require:

- the system firmware PXP027.rev19 or higher

PXM3001 rev.01 (input DSP, ck=B25B)(itda,100208,scma).hex

- Improved operation with Motor Generator having nominal power lower than UPS nominal power

- Insert the handling of parallel system with single battery operation.

Note: this operation require:

- the board IGBT rectifier control version D or higher (9..2112B01 D_REV..)
- the system firmware PXP027.rev13 or higher
- the UPS must be already predisposed with the precharge circuit which uses an auxiliary low power transformer, in place of the two power resistor R1 R2

PXM3000 rev.16 (input DSP, ck=8C94)(itda,091028,scma).hex

- First edition

10. Document variation

REV 04 - 21/01/10

- Added information on paragraph 9 about: PXM3001 rev.19

REV 03 - 22/10/09

- Modified paragraph Preliminary Verification
- Added information on paragraph 9 about: PXM3001 rev.14
- Modified paragraph Rectifier Schematic
- Modified paragraph Troubleshooting

REV 02 - 22/06/09

- On paragraph “Preliminary Verification” correct JP15 with JP16.
- On paragraph “Put the board in bootstrap mode” improved information
- Add paragraph “Check of Link signal”

REV 01 - 21/04/09

- Added information on paragraph 9 about: PXM3001 rev.02
- Added information on paragraph 8 about: software Troubleshooting

REV 00 - 05/02/09

- First edition